FRAMING SYSTEM AND METHOD FOR ASSEMBLING THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of United States Provisional Application No. 60/539,361, filed January 27, 2004.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The invention relates to frame construction, such as decks and docks, and, more particularly, to a fastener-free framing system by which plank members are secured to frame members through ribs which are engaged within receptor pockets.

Description of Related Art

[0003] Exterior decks are considered to be the most popular addition to homes throughout the United States today. Decks are places where people can extend their living space beyond the walls of their home. Decks are built out of a variety of materials and are fabricated in a variety of designs.

[0004] Typically, decks and similar structures are constructed with horizontal planking materials and are fastened to an underlying structural frame. The most popular planking and structural framing material is pressure treated wood. Pressure treated wood contains harmful toxins; one of them is called Copper-Chromium Arsenic (CCA). It is designed to extend the life of the product in exterior elements and protect it from weather and insect infestation, such as termites. However, pressure treated wood planking tends to warp, rot, splinter and require periodic maintenance. These problems are inherent only in wood and are accelerated in exterior climates.

[0005] The structural frame for the majority of the decks built in the United States is constructed out of pressure treated wood due to the familiarity and availability of the product.

However, other alternative planking materials are plastic/wood composite, synthetic, extruded plastics, extruded metals, cold-rolled metals, and extruded aluminum, etc.

[0006] Attaching the planking to the structural frame with fasteners, through the surface into the underlying structure, is the most commonly accepted method in the industry. There are other methods that conceal the fastening system from the underside using special clips, brackets and the like. However, this typically requires the same amount or additional fasteners to adequately connect planking to the supporting substructure.

[0007] Attaching the planking to the structural frame through the top planking surface yields unsightly blemishes to the decking surface. Typically, planking members require two fasteners to be installed through its surface into the underlying substructure (joists) to be adequately installed. More specifically, where a planking member crosses over the underlying substructure, two fasteners must be installed.

[0008] Attaching the planking to the structural frame through the bottom planking surface using specialty clips is a slow and tedious process requiring more skilled labor and fasteners to adequately install. There are often space requirements below the structure and above the ground to adequately install subsurface fastening systems.

[0009] If nailed, these fasteners can work themselves out of the substructure, just above the surface, and cause injury. Special screws can reduce the chances of nail popping but are typically more expensive since they must be non-corrosive to avoid weathering and often require specialty tools to fasten them. Fastening the planks to the substructure using screws is the most advantageous method, however, it requires some skill to properly place so that the fastening holes align somewhat consistently with the others.

[0010] As mentioned, wood structures have many disadvantages. They rot, warp, split, splinter, burn, require annual maintenance, burn, get eaten by termites, are only produced in limited pre-cut lengths, and are not recyclable just to name a few. In order to extend the life

of wood structures, special preservatives, like Copper-Chromium Arsenic (CCA) are applied to them. However these chemicals have been found to be toxic and the growing environmental impact concerns have led the Environmental Protection Agency (EPA) to begin nationwide bans on these chemicals starting January 1, 2004. There will be serious impacts on the industry like lack of product supply, increased costs and product capabilities.

[0011] It is obvious that an alternative framing system that eliminates fastening of the planking must be developed. If it is possible to produce an alternative underlying framing structure that does not require chemicals treatment to make them effective, then that must be developed as well. Currently, there are no solutions that integrate popular planking systems like composite and extruded decking materials with the underlying substructure without the use of special fasteners like screws, nails or clips, etc.

[0012] Therefore, an object of the present invention is to provide a plank member that has a special shape integrated on the underside of the plank, which is used to attach itself to the underlying structure without fasteners.

SUMMARY OF THE INVENTION

[0013] One embodiment of the subject invention is directed to a framing system comprising a plank member having a front, generally flat, surface and an opposing back surface with at least one rib protruding therefrom or at least one receptor pocket extending therein. The framing system has a frame member of an underlying structure having at least one receptor pocket extending therein or at least one rib protruding therefrom, wherein the frame member rib or pocket is matable with the plank member pocket or rib. The at least one rib has a profile with a first side and a second side which diverge from one another as they extend away from the member to which they are attached and then converge. The maximum height of a rib occurs at the place of maximum divergence and the receptor pocket has a

minimum width less than that of the maximum height of the rib such that the rib may be captured within the receptor pocket..

[0014] Another embodiment of the subject invention is directed to a plank member comprising a front, generally flat, surface and an opposing back surface with at least one rib protruding therefrom. The at least one rib has a profile with a first side and a second side which diverge from one another as they extend away from the member to which they are attached and then converge. The maximum height of a rib occurs at the place of maximum divergence such that the rib is adapted to be received within a receptor pocket having a minimum width less than that of the maximum height of the rib.

[0015] Yet another embodiment of the subject invention is directed to a frame member of an underlying structure, wherein the frame member comprises at least one receptor pocket extending therein, wherein the pocket is adapted to receive a rib. The receptor pocket has a minimum width less than that of the maximum height of the rib such that the rib may be captured within the receptor pocket.

[0016] Yet another embodiment of the subject invention is directed to a method of assembling a framing system having a plank member with a front, generally flat, surface and an opposing back surface with at least one rib protruding therefrom or at least one receptor pocket extending therein and having a frame member of an underlying structure with the other of at least one receptor pocket extending therein or at least one rib protruding therefrom, wherein the frame member rib or pocket is matable with the plank member pocket or rib. The method comprises the steps of:

a) aligning the at least one rib with the at least one receptor pocket;

b) urging the at least one rib within the at least one receptor pocket until the rib snaps into the pocket; and

c) wherein the at least one rib or the at least one receptor pocket is resilient.

[0017] Still another embodiment of the subject invention is directed to a method of making a frame member adapted to receive protruding ribs from a plank member comprising the steps of:

a) punching slots within a flat sheet; and

b) bending the sheet into a structural member having a top surface and a bottom surface, wherein the slots extend within the top surface to provide a receptor pocket adapted to receive the protruding ribs from the plank member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Figure 1 is a perspective view of a framing system in accordance with the subject invention;

[0019] Figure 2 is an enlargement of the encircled portion found in Figure 1;

[0020] Figure 3 is a section view indicating the manner in which the plank member and frame member are engaged;

[0021] Figures 4A and 5A are section views similar to that of Figure 3, but illustrating different embodiments of the plank member;

[0022] Figures 4B and 5B are section views identical to Figures 4A and 4B, except the rib in each is in a compressed state;

[0023] Figures 6A and 6B are side views similar to that of Figure 3, but illustrating how the frame member may deflect to accommodate the rib;

[0024] Figure 7 is a section view of a framing system with the receptor pockets on the plank member and the ribs on the frame member;

[0025] Figure 8 is a section view of the plank member with a separate piece rib attached thereto;

[0026] Figure 9 is a section view of the framing system with overlapping plank members;

[0027] Figure 10 is a side section view of a plank member and end view of a frame member;

[0028] Figures 11-16 are alternate embodiments of the plank member;

[0029] Figures 17A-17G illustrate sketches of different rib profiles;

[0030] Figure 18 is a section view illustrating a dovetail arrangement for the rib and receptor pocket;

[0031] Figure 19 is a top view of a flat plate prior to being formed into a plank member;

[0032] Figure 20 is an end view of a finished plank member;

[0033] Figure 21 is a side view of the framing system being utilized for a wall; and

[0034] Figure 22 is an end view of a framing member with a rib embedded therein.

DETAILED DESCRIPTION OF THE INVENTION

[0035] Figure 1 illustrates the framing system 10 in accordance with the subject invention, while Figure 2 illustrates an enlargement of the encircled portion of the framing system 10 in Figure 1. The framing system 10 is comprised of a plank member 15 having a front generally flat surface 17 and an opposing back surface 19 with at least one rib 20 protruding therefrom. A frame member 25 of an underlying structure 27 has at least one receptor pocket 30 extending therein. The rib 20 extending from the plank member 15 is matable with the receptor pocket 30 of the frame member 25.

[0036] Figure 3 is a side view of a portion of the framing system illustrating the manner by which the rib 20 of the plank member 15 engages the receptor pocket 30 of the frame member 25. In particular, the rib 20 has a profile with a first side 35 and a second side 37 which diverge from one another as they extend away from the plank member 15 to which they are attached. Thereafter, they converge and connect with one another. The maximum height H of the rib 20 occurs at the place of maximum divergence. The receptor pocket 30

has a minimum width W less than that of the maximum height H of the rib 20 such that the rib 20 may be captured within the receptor 30. It should be noted that while the rib 20 has a general shape of a teardrop, it will hereinafter be made clear that this shape is not to be intended as a limitation to the subject invention.

[0037] As illustrated in Figure 1, the plank member 15 and the frame member 25 are secured to one another through the engagement of the ribs 20 with the pocket receptors 30.

[0038] In one embodiment of the subject invention, the rib 20 is resilient such that the rib 20 deforms in order to enter the receptor pocket 30. Directing attention to Figure 3, the height H of the rib 20 would diminish so that the rib 20 would be able to enter the receptor pocket 30. This may be achieved in one of at least two ways.

[0039] In particular, with attention directed to Figure 4A, the rib 20 may have a hollow interior 40 such that a compressive force indicated by arrows 42 will deform the walls 44 of the rib 20, as illustrated in Figure 4B, such that the resultant height J is less than the width W of the opening within the receptor pocket 30. Because the rib 20 is resilient upon entry within the receptor pocket 30, the rib 20 will expand, thereby locking the plank member 15 within the frame member 25. The walls 44 of the rib 20 actually bend to provide the resiliency of the rib 20.

[0040] As illustrated in Figure 5A, the rib 20 may also be made of a resilient material which itself compresses. In particular, Figure 5A illustrates the rib 20 having a height H and subsequent to compressive forces 42, the rib 20, which may be solid, resiliently compresses to a height J as shown in Figure 5B, sufficient to fit within the receptor pocket 30.

[0041] It should be noted that the compressive forces 42 required to reduce the width of the rib 20 are those compressive forces generated by urging the plank member 15 against the receptor pocket 30 of the frame member 25.

[0042] In yet another embodiment of the subject invention illustrated in Figures 6A and 6B, the receptor pocket 30 has receptor pocket walls 46, 48 which initially have a width K and are expanded by the rib 20 having a height H such that the width K of the walls 46, 48 expands to accommodate the height H of the rib 20, as illustrated in Figure 6B. Under these circumstances, the rib 20 is relatively rigid and the materials of the frame member 25 must be resilient.

[0043] Typical materials that may be used for the rib 20 may be structural metal of any kind, wood, wood composites, cementitious composites, plastic composites, structural steel composites, fiberglass, and carbon composites. It should be appreciated that this list is not exhaustive and that any material suitable for the application described herein may be suitable.

[0044] In each of these scenarios described in Figures 4A through 6B, at least one rib 20 or the receptor pocket walls 46, 48 are rigid.

[0045] What has been discussed so far is a receptor pocket 30 within the frame member 25 and the rib 20 within the plank member 15. Directing attention to Figure 7, it is entirely possible for the plank member 15 to have receptor pockets 50 while the frame member 25 has ribs 55 which engage the receptor pockets 50 in the manner previously described.

[0046] Directing attention to Figure 8, it is also possible for the rib 20 to be a separate piece 60 secured within the plank member 15 or, in the alternative, secured within the frame member 25, which is not shown but is an obvious variation of the arrangement illustrated in Figure 8. The rib 20 may be secured to the plank member using any number of different fastener techniques. As an example, the rib 20 may have a threaded shank 62 which engages the plank member 15.

[0047] Figure 9 illustrates a cross-section view of one embodiment of the framing system 10, whereby each plank member 15 has a recess 65 which is covered by an overhang 70 in an

adjacent plank member 15'. Such an arrangement promotes retention of the plank member 15 within the frame member 25.

[0048] Figure 10 illustrates a side view of the framing system 10, whereby the rib 20 of the plank member 15 is aligned to be engaged with a plurality of frame members 25. A complete framing system 10 may be comprised of a plurality of plank members 15 arranged side-by-side over a plurality of spaced apart frame members 25.

[0049] In one embodiment illustrated in Figure 11, the plank member 115 may have a tongue 117 on one side and a groove 119 on the other side which engage a mating groove 119' in plank member 115', and a mating tongue 117' associated with plank member 115".

[0050] It should be appreciated that one focal point of the subject invention is the interlocking ribs and receptor pockets. The plank member may embrace a variety of different designs to satisfy the different needs to which the framing system may be subjected.

[0051] Figure 12 illustrates a plank member 215 having a generally oval cross-section with ribs 220 similar to those previously discussed extending therefrom.

[0052] The material of the plank member discussed herein may be wood, composite wood, metal, plastic or a carbon fiber composite. As an example, if the rib 220 of plank 220 is solid therethrough, then it is necessary for the material of the rib 220 to itself be resilient such that the rib 220 resiliently fits within the receptor pocket 230 of the frame member 225. In the alternative, if the rib 220 has a hollow portion therein, then it is only necessary for the walls of the rib 220 to flex to fit within the receptor pocket 230. Furthermore, as previously discussed, it is also possible for the receptor pocket walls to have resiliency themselves to accept a rib 220.

[0053] Figure 13 illustrates another variation of a plank member 315 having a front surface 317 and a back surface 319 with ribs 320 protruding therefrom. The variety of designs available for the plank member 315 are unlimited inasmuch as the back surface 319 has

extending therefrom ribs 320 that may interlock with receptor pockets (not shown) of a frame member.

[0054] Figures 14, 15 and 16 illustrate further variations of plank members 415, 515, 615, respectively, having back surfaces for 419, 519, 619 with ribs 420, 520, 620 extending therefrom. The designs illustrated in Figures 14-16 are of particular interest because these designs may be fabricated through extrusion processes using a variety of different materials including structural steel, structural metal, and structural plastic or other structural materials capable of being extruded.

[0055] The ribs 20 so far discussed have been in the general shape of a teardrop. A number of other rib shapes may be used inasmuch as these ribs may be snapped into the receptor pocket 30 of the frame member 25. Figures 17A-17G illustrate a few such ribs 720 shapes. In each of these shapes, the first side 722 divergence from the second side 724 and then converges. As a result, these ribs 720 may snap into an approximately sized receptor pocket (not shown) located in the frame member. As illustrated in Figures 17F and 17G, each rib 720 may also resemble a barb 726.

[0056] Briefly returning to Figures 1 and 2, one method of attaching the plank member 15 to the frame member 25 is to press the plank member 15 against the frame member 25 such that the ribs 20 resiliently deform to engage the receptor pocket 30 or, in the alternative, a rib 20 engages the resilient walls 46, 48 of the receptor pocket 30 until the rib 20 snaps into place within the receptor pocket 30. It should be appreciated that, to the extent the rib 20 conforms with the shape of the receptor pocket 30, it is possible to slide the plank member 15 into the frame member 25 such that the rib 20 engages the receptor pocket 30 without the need for resilient deformation. Under such circumstances, the plank member 15 slides into the frame member 25 from the side. Since the rib 20 is no longer required to resiliently fit with the receptor pocket 30, the shape of these two elements may change.

[0057] Directing attention to Figure 18, a plank member 815 may have a rib 820 in the shape of a dove-tail which engages the frame member 825 through a receptor pocket 830 in the shape of a matching dove-tail. It should be appreciated that, while the shape of the dove-tail has been presented, any number of different positive locking shapes may be utilized for this arrangement.

[0058] The subject invention is also directed to a method of assembling a framing system 10 having a plank member 15 with the front generally flat surface 17 and an opposing back surface 19 with at least one rib 20 protruding therefrom or at least one receptor pocket 30 extending therein and having a frame member 25 of an underlying structure with the other of at least one receptor pocket 30 extending therein or at least one protruding rib 20 extending therefrom. The frame member rib 20 or pocket 30 is matable with the plank member pocket 30 or rib 20. The method comprises the steps of aligning the ribs 20 with the receptor pockets 30. The ribs 20 are then urged within the receptor pockets 30 until the ribs 20 snap into the pockets 30. For this to occur, the rib 20 or the receptor pocket 30 must be resilient.

[0059] In an alternative embodiment, the method of assembling a framing system 10 would comprise the steps of aligning the rib 20 with the receptor pocket 30 and sliding the rib 20 within the receptor pocket 30 until properly positioned. Under these circumstances, it is not necessary for either the rib 20 or the receptor pocket 30 to be resilient.

[0060] So far illustrated is a frame member 25 having a generally C shape. Although other shapes may be utilized, this is a convenient shape that will typically be implemented for these structures. Figures 19 and 20 illustrate the method by which the frame member 25 is manufactured from a flat sheet 900. In particular, openings 905 are punched within the flat sheet 900, wherein at each end of the opening 905 is a slightly enlarged portion 910 which, in this instance, is designed to have the general shape of a rib 15 illustrated in Figure 1. Once the openings 905 are punched, the flat sheet 900 is then bent into a structural member having

a top surface 915 and a bottom surface 920, wherein the openings 905 extend within the top surface 915 to provide a receptor pocket 930 adapted to receive the protruding ribs 20 from the plank member 15 illustrated in Figure 1.

[0061] While Figures 1 and 2 illustrate the use of the framing system 10 for decking, the framing system 10 should not be limited to such applications and may be used in any application for which this design is appropriate. Figure 21 illustrates the use of the framing system 10 as a fence or a wall. The framing system in accordance with the subject invention may have a multitude of other applications including use as a dock or an interior or exterior wall of a structure such as a building.

[0062] Figure 22 illustrates a sketch whereby the rib 1020 is embedded within the frame member 1025. This may be achieved by embedding the rib 1020 during an extrusion process used to form the frame member 1025.

[0063] While specific embodiments of the invention have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details could be developed in light of the overall teachings of the disclosure. The presently preferred embodiments described herein are meant to be illustrative only and not limiting as to the scope of the invention which is to be given the full breadth of the appended claims and any and all equivalents thereof.